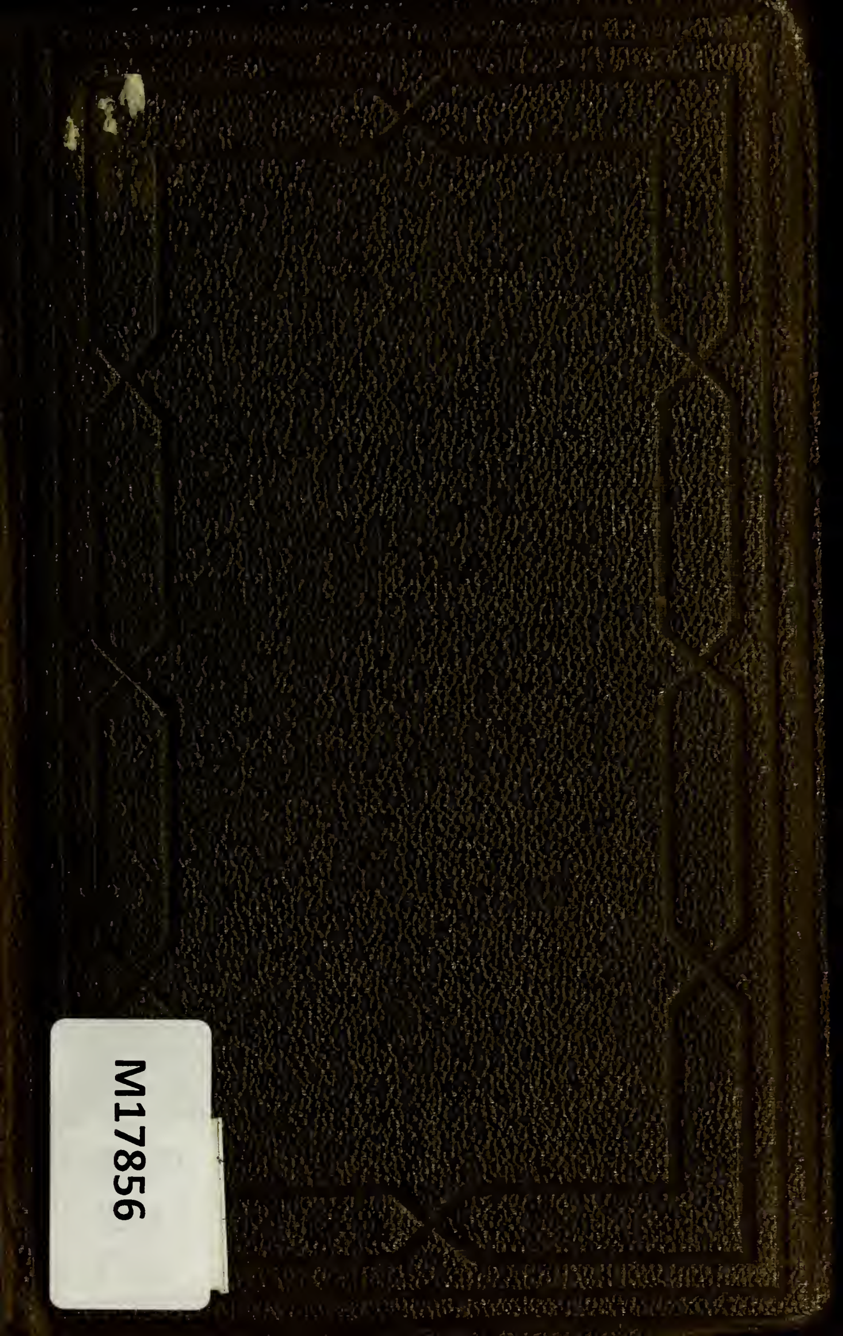

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ON DIPHTHERIA

AND

DIPHTHERITIC DISEASES.

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ON

DIPHTHERIA

AND

DIPHTHERITIC DISEASES.

BY

J. WEST WALKER, M.B. LOND.,
M.R.C.S. AND L.M. ENG., L.S.A.

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TO

GEORGE WALKER, ESQ.,

THE FOLLOWING PAGES

ARE

GRATEFULLY AND RESPECTFULLY

INSCRIBED

BY

AN AFFECTIONATE NEPHEW.

THE substance of what follows was originally presented to the members of the British Medical Association in a series of communications to the Journal. I have ventured to re-arrange the matter, and to reprint it, under the hope that I may be thereby contributing a mite towards the elucidation of those mysterious and alarming phenomena, for the present, comprehended in and represented by the name *Diphtheria.*

ON DIPHTHERIA

AND

DIPHTHERITIC DISEASES.

PART I.

An inquiry into the nature of diphtheria constitutes at the present day a most interesting and important subject of medical study. It is interesting on account of the comparative novelty of the affection, and of the as yet unsatisfactory state of our knowledge bearing upon the questions of its pathology and treatment. It is important owing to the terrible mortality with which the disease has hitherto been so frequently attended. Happily the mortality, which occurred more especially during the climax of the present epidemic, has of late considerably diminished,* the disease, however, still continues to prevail to an extent sufficient to keep the public mind in a state of anxiety and alarm, and, as I trust, to justify any one who shall endeavour to contribute, however slightly, towards a better understanding of its true nature.

As might be expected, a visitation so serious has greatly aroused the observant faculty of the profession; and thus facts have been abundantly accumulated and recorded, and speculations the most opposite and conflicting, freely and confidently promulgated. To attempt to generalise somewhat these facts, and reconcile these opinions, is what I propose to myself in the present essay.

By some, by far the greater number of my professional brethren, diphtheria is looked upon as a distinct acute specific disease, having general and local symptoms; and this is the view which justifies our great nosologist, Dr. Farr, in giving to it its present name and place in his classification of diseases. By others, again, it is believed to be but a modification of some one of the previously recognised diseases—of common epidemic sore throat, of scarlet fever, of croup, &c.; and unquestionably a considerable amount of evidence can be adduced to show a close relationship, in particular cases, between diphtheria and each one of these several disorders; thus tending to prove that, whatever the true nature of the affection may be, it must have a relation to them all generally, rather than to any one particularly.

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* The deaths from diphtheria were 9587 in 1859, but had declined to 4903 in 1862. See Dr. W. Farr's statement to the Registrar-General on the causes of death in England for 1862.

The principal characteristic of diphtheria, that from which the disease takes its name, undoubtedly is the peculiar, leather-like, pseudo-membranous *formation*;* and this it is which I propose to consider first. I shall, in the second place, examine into the general symptoms with which this pathognomonic sign is observed to be associated. Thirdly, I shall endeavour to find out what relation or connection, if any, the general and local symptoms have to one another. Lastly, I hope then to be able to build up a theory of the disease under consideration.

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* I employ the word *formation* here and in other parts of this essay, not because I particularly like it, or think it conveys a very correct idea of the thing signified, but because I consider it less objectionable than *exudation*. I use the term as expressing merely a something

I. In speaking of the *physical properties* of the diphtheritic formation, it will be sufficient to consider it as when fully matured; for, owing to the rapidity of its construction, and to other circumstances, it is often very difficult to trace it through its stages of development and growth. It will be found to vary greatly in colour, tenacity, consistence, &c., according to the situation of the surface upon which it may chance to be engendered, the stage of development, and

---

formed, without implying anything as to the how or whence formed. Exudation, I believe, expresses but one of the factors necessary for the construction of this singular morbid product.

other modifying influences. In some cases it presents the appearance of curd or cream; in others that of white kid or wash-leather; and between these extremes may be observed every gradation of consistence. The *soft* or curdy variety is always greatly infiltrated with various secretions, the subjacent part being in a state of much exudative inflammation. Under the microscope, according to Dr. Jenner, it consists of "pus corpuscles, other larger and smaller corpuscles, epithelium, and oleoprotein granules." The *tough* variety may be seen either in isolated distinct patches, or as an uniform layer, forming a complete mould of the underlying surface; and when well developed, it has the tenacity of leather. At the centre, its thickest part, it has been known to measure as much as the eighth of an inch, gradually becoming thinner towards the edges. The colour varies from white to yellowish-white; or, owing to the admixture of blood, to brown or black. When about to be thrown off, a process of decomposition takes place, beginning at the edges; and then it is that fœtor is perceived.

The microscope, beyond the fibrous character, reveals chiefly negative properties; it seldom discloses vegetable or other growths, though such organisms have been from time to time detected by skilful observers in and about the diphtheritic product. It is soluble in alkalis; shrivels in acids; out of the body it gradually softens and decomposes. It is never organizable.

Such is a slight sketch of some of the facts which have been observed, bearing chiefly upon the physical properties of this pathognomonic sign. There are, however, other features of perhaps greater importance, which require enumeration. Thus, with regard to its site; it is a singular and important fact that it manifests itself on such parts of the body only as are exposed to the action of the air; hence it follows that it is to be met with on any part of the skin, and on a limited portion of the mucous membrane, as, for instance, that of the lips, gums, cheek, fauces, tonsils, palate, uvula, pharynx, and possibly, though rarely, the uppermost part of the œsophagus, the interior of the nose, lacrymal canal, larynx, trachia, and bronchial tubes — the conjunctival membrane of the eye, and the lining membrane of the pudenda, vagina, and os uteri. On the subject of this selection of site, Empis, in a valuable essay translated by Dr. Semple for the new Sydenham Society, remarks: "One fact which is rather remarkable in relation to the seat of *diphtherite*, is this, namely, that all the parts which are completely removed from the contact of the air are preserved from the invasion of the disease. Thus, we very frequently see the membranous affection occupying the lower part of the throat, and the posterior wall of the pharynx, and spreading gradually to the larynx and the deeper parts of the air-tube; but I have never seen true *diphtherite* propagating itself by continuity into the œsophagus and the parts of the digestive canal which are withdrawn from the influence of the air;" and he naïvely asks, "May the presence of air, then, exert, in these circumstances, some influence which escapes our notice?" ('Memoirs of Diphtheria,' New Sydenham Society, p. 311.) That the diphtheritic formation, whether occurring on either of these sites—the tegumentary or mucous surface—is essentially a like morbid product, is, I believe, generally admitted. The fact, however, is clearly established by Trousseau and Daviot, in their respective essays, by reference to numerous cases. The latter author, in another of Dr. Semple's translations, says: "There is also a point upon which I ought to insist, in order to prove, if necessary, the perfect identity existing between pellicular inflammation of the mucous membranes and cutaneous *diphtherite*. It is the fact that, during our epidemic, under the influence of the same cause and a similar predisposition, I have seen *diphtherite* ranging simultaneously on several members of the same family, attacking in one, the pharyngeal mucous membrane; in another, the cutaneous tissue; in another, the respiratory passages; and, lastly, in another, all those organs at once or successively, and presenting no other modifications than the symptomatic differences peculiar to each region." (New Sydenham Society's 'Memoirs,' p. 379.)

Another peculiarity of this diphtheritic formation, about which most observers are agreed, notwithstanding the remark of Daviot to the contrary, is, that in order for its appearance on the *skin*, the epidermis must at least be removed. It may then be seen complicating and interfering with the proper healing of slight abrasions, ecchymoses, leech-bites, blistered surfaces, herpetic and other eruptions, cuts, wounds, burns, &c. So also, in order for its appearance on the *mucous membrane*, I think it will always be found that the site chosen is a part, which at the time is congested, ecchymosed, inflamed, ulcerated, or undergoing some pathological process.

It is, however, to a third peculiarity; viz., its great proneness to spread, especially in a downward direction, either by extension of an individual patch, or by coalescence of patches having distinct centres of origin, and thus, as in the larynx, affording mechanical obstruction to the performance of a vital function; that probably the greatest importance is to be attached to the presence of this singular morbid product.

II. Let us now glance at the constitutional symptoms with which this leather-like sign is found to be associated. The first thing which strikes us is their great variety in kind, and their still greater diversity in severity and importance. In some cases, especially in the many instances of *cutaneous* diphtheria, constitutional symptoms may be considered as almost or altogether wanting; the general health may, I grant, perhaps be somewhat deranged; but we are quite unable to trace the slightest connection between such derangement and the purely accidental formation of the diphtheritic product. The same, too, holds good when the formation presents itself on the parts within the cavity of the *mouth*, on the lips, gums, lining membrane of the cheek, &c. It may then, almost always be observed that, whenever general symptoms are present, they denote such a derangement of the system as occurs in canker, stomatitis, and other allied affections.

The patient may show signs of disordered nutrition, vitiated secretion, unhealthy digestion, general debility, &c.; but nothing which can in any way be considered as having any specific relation to the diphtheritic formation. It is, however, in the *throat* that the characteristic pseudo-membrane is most frequently to be seen; so much so that by those who advocate the doctrine of diphtheria being a distinct specific disease, this region of the body is considered to be the special seat of the local symptom. When, however, we look to facts, we find the diphtheritic formation, even here, to be associated with the greatest possible variety of general symptoms. The throat, with regard to its pathology, is a peculiar region; being, as it were, an inner portal between the external world and the interior of the economy; it has to receive the impression of all atmospheric changes or impurities. In this climate of ours, many habitually suffer from throat ailments, enlarged tonsils, ulceration, or that form of chronic inflammation termed relaxed throat; and with such ailments the diphtheritic formation frequently co-exists, general symptoms being almost or altogether absent. Not unfrequently the formation makes its appearance in the latter stage of phthisis and other chronic disorders. These exhausting general diseases are numerous, and differ greatly in specific characters; and yet diphtheria is said to be connected with them all, thus making it self-evident that it can have no special relation to any one. Again we find that, a more or less sore throat, in other words, a pathological change going on in the mucous membrane of the throat, is the constant concomitant of nearly all the acute specific diseases and with the diseases of this group, diphtheria, in common parlance, is said to be in frequent combination. In all such cases as these, we are compelled to admit either, that diphtheria is a constitutional disease, which can co-exist in the same body, and at the same time, not only with one, but with a great variety of general diseases; or, that the particular manifestation is but a local complication, which at certain seasons affects and fixes upon parts of the body undergoing disease.

Owing to the possession of certain positive characteristics, several diseases of the fever class now admit of accurate and close definition, thus rendering their recognition comparatively easy and sure. Between these well-defined affections and the condition of uninterrupted health, there exists, I believe, an important series of general diseases belonging probably to the same class, but which, owing to the possession of only negative properties, are incapable of such accurate definition or classification. All we know is, that the balance of the economy is disturbed, that general fever exists, and when, as is not unfrequently the case, local complications co-exist; we give names, and direct attention to such local complications rather than to the specific blood disease with which they may happen to be associated. When epidemic, as such diseases almost always are, we speak of them as the "reigning illness," influenza, or, as when accompanied with sore throat, epidemic sore throat,

&c. Now and then herpetic eruptions appear in the course of such complaints, always producing improvement in the general symptoms; and thus manifesting a close relationship to the exanthemata. Not unfrequently inflammation of the lungs, or of some other organ, attends these disturbed states of the system, when the co-existing inflammation becomes all important, and its origin in a disease of the constitution frequently overlooked and misinterpreted; and (to digress a moment), in this fact may, as I believe, be found the reconciliation between the various opinions existing as to the right mode of treating that terrible disease, pneumonia. When it is idiopathic, occurring, as a very rare affection, in otherwise healthy subjects, possibly the heroic remedies so much extolled by practitioners of the last generation may answer best; while for the blood disease, running as it does its appointed course, it is marvellous to what extent the local inflammation may be neglected, and the somewhat expectant plan of Dr. Hughes Bennett, or the more decidedly stimulating plan of the late Dr. Todd, be resorted to. These several blood diseases may either one and all be the effect of a single cause, manifesting itself in a diversity of ways, owing to modifying influences; or of a variety of causes closely related, or possibly correlated to one another. Be this as it may, should such diseases at any time appear with well marked epidemic prevalence, virulently typhoid characteristics, malignant consequences, and having throat ailments as the particular local complication, we have all the circumstances which obtain, with regard to general symptoms, in the most well marked cases of diphtheria. And, should such general symptoms be found to occur only in connection with the diphtheritic formation, or, on the other hand, it only with them, we might be justified in looking upon them as component parts of one specific disease. Unfortunately, however, both these premises are found to be faulty, the latter especially so; for, even when in the throat, we find this remarkable formation co-existing with the general symptoms, not only of all the acute specific diseases, scarlet fever, measles, small-pox, erysipelas, ague, &c., but with every possible derangement of the general health.

If the faucial region is the most common site for the diphtheritic formation, the *laryngeal* is by far the most dangerous and important, and here it is that we observe such general symptoms as attend cases of croup; which disease may be primary and uncomplicated when it commences in the respiratory tube, or secondary and complicated when it is simply an extension of mischief from above, the croupal symptoms being then mixed up with those of the primary disease under which the patient at the time laboured. Diphtheritic measles is particularly liable to be attended with croupal symptoms.

III. Now comes the question: What connection or relation is there between the general symptoms and this remarkable local manifestation? We have seen the former to be most varied in every particular, the latter to be *sui generis* with regard to physical properties, and possessed of certain pathological peculiarities. But, more than this. We are quite unable to establish any concordance between the amount of the local complication (except in croupal cases) and the severity of the case; frequently the danger is but slight, and the formation very abundant; and, on the other hand, the formation may be very scanty, and the danger most imminent. This latter state of things particularly prevailed in the Brighton epidemic; so much so, that Dr. Ormerod, who contributed an account of it to the 'Lancet,' somewhat complains that the name diphtheria inadequately conveys a correct idea of the nature of the disease. Again, there is no order of time or sequence as to the appearance of the local sign, as is the case with the exanthemata. Often the characteristic formation is abundant before the development of general symptoms; and often, again, it appears at the climax, or during the latter stages of some general complaint. And, lastly, we have the important fact of the reappearance of the formation in the same subject in connection, not only with like, but often with vastly different, general symptoms. When, then, we consider these facts, coupled with the pathological peculiarities of the diphtheritic product before enumerated—its presence on parts only which are exposed to the action of the air, and requiring such parts to be undergoing morbid changes—we have an accumulation of evidence pointing to the conclusion that there is no especial relationship between the characteristic local sign and any one particular state of the general system, but that the diphtheritic formation is merely a local and external complication, which, as it were, engrafts itself on many diseases generally.

IV. If these suppositions be correct, the true *nature* of diphtheria must be very different from that hitherto received. We can no longer consider it to be an acute specific disease, having uniform general and local symptoms. The leather-like formation, hitherto held to be the diagnostic sign, at once loses its significance, if it have to be viewed only in the light of a complication of nearly every ill that flesh is heir to; manifesting itself, it is true, only at certain seasons, such seasons being noted for the extensive prevalence of zymotic diseases generally. To show that the season of the present diphtheritic epidemic is so noted, I quote the following from Mr. J. N. Radcliffe's paper in the 'Lancet' (July 12, 1862). He says: "If we examine the mortality returns for the thirteen years, 1847 to 1859, we find that *scarlet fever* underwent a prodigious increase in 1858, and prevailed in that year to a greater extent than in any previous year of the thirteen. (The annual average of deaths from this disease in the thirteen years was 17,411; the deaths in 1858 amounted to 30,117.) The mortality from *croup* advanced year by year from 1854, the disease being epidemic in 1856-57-58-59, the epidemic culminating in 1858. The mortality from this disease was also prodigiously above the average of preceding years, increasing from 3,660 in 1853, to 6,220 in 1858. The mortality from *thrush* was also greatly in excess in 1858-59. The mortality from *quinsy* was in excess in 1857-58, in the latter year attaining a higher point than in any previous year. The mortality from *noma* underwent a remarkable increase in 1855-56-57-58-59, the acme being in 1857. Finally, the mortality from *laryngitis* underwent a steady development from 762 in 1847, to 1439 in 1858! In fact, it is not too much to say," he goes on, "that all the affections allied to diphtheria prevailed epidemically, contemporaneously with the epidemic of diphtheria." In other words, all and every state or condition of the general system with which the diphtheritic formation is known to be associated, prevailed epidemically, contemporaneously with the present epidemic of diphtheria. Let me not be misunderstood. I dare not, and do not, deny that during a diphtheritic epidemic a distinct, and to a certain extent, new miasmatic disease may possibly exist, to which the name diphtheria may, though rather inaptly, be applied; all I maintain is, that if such a disease do exist, we have no positive means of recognising it; and that, as far as its general symptoms go, they only represent a condition of blood-poison analogous to, though possibly increased in severity over, diseases already known—presenting differences of degree more than of kind; and that the so-called local pathognomonic sign, associated, as it is found to be, with an endless variety of general symptoms, can no longer be employed as a means of diagnosis.

But, it may be asked, are not swollen glands, albuminous urine, and the numberless varieties of nerve-derangement, symptoms sufficient to show diphtheria to be altogether distinct and different from other general diseases? In Dr. Jenner's book (p. 7), there is a foot-note which, in my humble opinion, sets glandular enlargements as a symptom of diphtheria in a proper light. He says: "Trousseau attaches much diagnostic value to the enlargement of the lymphatic glands of the neck in diphtheria. I cannot agree with him on this point. The enlargement of the glands has been, in the cases of diphtheria which I have seen, in proportion to the severity and depth of the local, nasal, pharyngeal, laryngeal, and tracheal disease. I have never seen it greater in proportion to the local primary mischief than in other forms of cynanche pharyngea. In children generally, the swelling of the glands, other things being equal, is greater than it is in adults; and in strumous children the enlargement is always greater, other things being equal, than it is in rickety or in healthy children." Albuminuria occurring in a diphtheritic case is, certainly, a symptom of grave import; and great credit is due to Dr. Willoughby Wade, of Birmingham, for being the first to direct attention to it. Its presence may, perhaps, assist us in forming our prognosis; but for diagnostic purposes it avails absolutely nought. In well-marked cases of acknowledged diphtheria it is as often absent as present; it is absent often in cases the most severe, and present in cases comparatively mild. In short, it can only be looked upon, as Dr. Headlam Greenhow has it, as an occasional concomitant of the complaint. Of all the symptoms indicative of diphtheria being a distinct general disease, the various manifestations of nerve-derangement undoubtedly claim the first place. Analogous conditions have been observed from time to time in connection with other general diseases; though I must confess with scarcely the same regularity and frequency. Unfortunately these symptoms, when present, appear too late to be of any diagnostic value. They occur mostly as sequelæ; and, although they may perhaps indicate the prior condition of the system to be somewhat new in its nature, for practical purposes they become comparatively useless. Such sequelæ differ greatly in general characters, are possibly dependent upon a variety of causes and conditions, and are, quite as likely, common to an epidemic of many analogous diseases, as the exclusive property of one. But if, for the sake of argument, we allow the three symptoms just mentioned to be sufficient to indicate a specific general disease, we ought at least to find them to be constantly associated in the same individual case, a condition of things by no means corroborated by clinical experience; otherwise, these three several symptoms might just as well be held forth as indicative of three several states of system, and thus be made to support the theory of diphtheria being made up of a number of different diseases.

If, then, a variety of general diseases, alike only in having the common diphtheritic complication, are any longer to be considered as one distinct disease to be called diphtheria, the sooner for all practical purposes the name is done away with the better, for it cannot but mislead. It conveys not the slightest notion of the true nature of the affection (or affections); and it renders utterly nugatory all attempts to reduce either diagnosis, prognosis, the question of contagion, or the method of treatment, to a scientific basis. Far better would it be to apply the word to all and every case generally, no matter what the general symptoms may be, wherein the pathognomonic sign presents itself, only reducing it to the rank of a qualifying adjective. We should then speak of cases as diphtheritic, whatever the general symptoms showed the patient to be at the time labouring under. We should be induced to study more closely such coexisting malady, and, not being led away by a name, be more likely to form a correct idea of any particular case.

The *theory* of the nature of diphtheria to be induced from the foregoing facts and observations may be briefly stated in the following conclusions, viz.:

1. The characteristic formation is but an external complication, and has no specific relation to any one particular state of system.

2. The general symptoms with which this formation is found to be associated are very various; ranging from the most trifling *malaise* to the most virulent septicæmia, and extending through the whole class of acute specific diseases.

3. Possibly, during the prevalence of a diphtheritic epidemic, there may be a distinct general disease, altogether different from other known diseases; but we have no *positive* evidence on the subject.

4. Diphtheria, in the sense in which the

word has hitherto been employed, is to be looked upon, not as one disease, but rather, as many diseases alike only in being associated with the common characteristic formation.

Believing as I do, the theory of the nature of the disease under consideration, embodied in the above conclusions, to be essentially correct, I purpose in the remaining portion of this essay to point out how many of the discrepancies which have hitherto prevailed on the subject are, by it, readily removed and explained away. In short, I hope to establish its truth somewhat deductively; and to show—

That the difficulties which have hitherto beset bibliographers in collecting the ancient history of the disease are, in a very great degree, removed;

That the various questions arising on the subjects of diagnosis, prognosis, etiology, and contagion, admit of more satisfactory solution; and

That treatment having more reliable indications becomes less empirical, more rational, and more successful.

PART II.

One of the greatest difficulties with which those who have written on the *history* of diphtheria have had to contend, has been to determine whether the author they were quoting was describing diphtheria, in the generally accepted sense of the term, or merely instances of ordinary diseases complicated with peculiar manifestations. We frequently read of cases wherein the characteristic false membrane is so minutely and accurately described, both with regard to its physical and pathological properties, as to leave no doubt as to its perfect identity with the like phenomenon as at present seen; and yet in the same case, or series of cases, we find, perhaps, as clearly portrayed the diagnostic sign of some well-known general disease, the eruption of an exanthem, the false membrane of croup, &c. Then it is we become impaled on the horns of a dilemma; we must either reject such cases as evidence of the previous existence of diphtheria as a specific disease, or we must acknowledge, that of old, as at present, the pathognomonic sign was observed to present itself in connection with a great diversity of general symptoms. Should the foregoing conclusions be correct, this difficulty no longer exists, and the study of the earlier history of the affection (or affections) becomes proportionately more simplified and intelligible.

My position would perhaps be best illusstrated by selecting extracts from different authors who have written on the history of diphtheria, but to do so would carry me beyond the limits of a *brochure* like the present. If we take, as one example, Dr. Headlam Greenhow's classic work on the subject, and refer to his chapter on "Diphtheria in the Sixteenth, Seventeenth, and Eighteenth Centuries," I think that, notwithstanding the extreme care with which his cases are selected, abundant evidence can be found to show that the difficulty in question exists, and that many different general diseases, alike only in being complicated with the common diphtheritic sign, have been confounded together and brought forward as supporting the fact of the previous existence of a *soi-disant* specific disease. We shall find sufficient to show that during the later centuries, as is familiar to every observer in the present, the diagnostic sign of diphtheria—the peculiar formation—was observed to be associated with scarlet fever, with epidemic sore-throat, on blistered and erysipelatous surfaces, with small-pox and with measles, with croup, with "putrid fever of any kind" (and this class would probably include those cases wherein purpura and petechiæ are mentioned as symptoms), with ague or remittent fever. A goodly list of general diseases which, were I to quote from Dr. Greenhow's next chapter, on "Diphtheria in the Nineteenth Century" might be considerably increased. In short, the more nearly we approach the time of our own epidemic, the more closely particular cases are watched, and their general symptoms faithfully recorded, the more conclusive becomes the evidence that there is no one particular state of the general system to which the term diphtheria can, with any approach to precision, be applied, but that hitherto all the ills that flesh is heir to have been huddled together as one disease, simply because they present a common complication.

The difficulty then presents itself: Can we receive records such as those alluded to as evidence of the previous existence of diphtheria? If we adopt the theory here advocated, the question admits of ready and easy answer, for they unquestionably prove the previous existence of epidemics of diseases in connection with the remarkable diphtheritic product; but if, on the other hand, we agree with those who believe in the theory of diphtheria being an acute specific disease, the question at once becomes surrounded with difficulties, and we are compelled to resort to such apologetic phrases as "It seems probable, as has sometimes happened in more recent epidemics, that scarlet fever and diphtheria were intermingled; that the cases of *scarlet fever* had a *diphtheritic character;* and that whilst in all probability Dr. Fothergill saw some cases of uncomplicated diphtheria, he yet *confounded* the two diseases." Again, "That the epidemic of diphtheria of that day, like that of our own time, was apt, so to speak, *to impress its character upon other diseases,* and included simple sore throats unaccompanied by exudation, as well as those of more malignant nature." Again, "That diphtheria in that day, as well as in our own, was frequently *confounded* with scarlet fever" (Greenhow, pp. 28, 30, and 35); not necessarily *confounded* at all, when we believe in the theory that would make scarlet fever, in common with a host of other general diseases, amenable to the influence of an external complication. What other specific disease *impresses its character* on such a number of fellow diseases? Why continue to believe in the existence of a disease, of which its strongest advocates are unable to adduce one diagnostic sign? Absent the peculiar complication—the diphtheritic false membrane—and what is diphtheria? Present it, and what is not?

Diagnosis.—Much has been written to show what diphtheria is not; very little to define what it is; and without something like a definition, without some signs or symptoms differing from the signs or symptoms of other diseases, diagnosis becomes almost impossible. Pages have been written and particular cases cited, to show that diphtheria is not scarlet fever, nor croup, &c., and to point out the differential diagnosis between it and these several diseases; but, on the other hand, equally well might pages be written to prove that, in particular cases, it is nothing more than one or other of these diseases peculiarly complicated. It is the specific disease theory which finds a difficulty in these apparently contradictory statements; and it is the same theory which demands from its votaries much, and to my mind, useless argument on the subject of diagnosis, but which has, I fear, succeeded only in making a very important subject a matter of confusion worse confounded. How often has every practitioner, whose lot it has been to practise during a diphtheritic epidemic, been asked the momentous question, Is it diphtheria? and found it perplexing at first how rightly to answer it. The term has become so associated with fearful consequences that he hesitates to apply it to mischief (in this particular case perhaps) so slight, and yet the diagnostic sign—there it is. He knows full well that he has frequently met in practice with the like sign in connection with a great variety of general diseases—the acute, the chronic, the benign, the malignant, the specific, the non-specific—that he naturally hesitates before giving a decided answer to the question, an answer which involves the application of a single term to a series of widely different phenomena, alike only in one, and that by no means most important feature. If we speak of diphtheritic diseases, diagnosis becomes at once rational and easy. When and wherever the formation presents itself—and I need not here enter on the diagnosis of that well-known morbid product — the case is clearly diphtheritic; but what the general disease with which it is associated may chance to be, must be left to the ordinary rules of diagnosis applicable to such general diseases.

Prognosis.—The diphtheritic complication manifests itself only during the extensive prevalence of the miasmatic order of zymotic diseases. Extensive prevalence of such diseases is almost invariably attended by great mortality. Hence, the presence of the diphtheritic sign is, by a defective process of ratiocination, supposed to have a direct connection with fatal consequences, and is always looked upon as a ground for unfavorable prognosis. Notwithstanding the weakness of the logic by which the conclusion is arrived at, it may for practical purposes be considered sufficiently satisfactory and safe. It is, however, only that kind of questionable safety which is had recourse to by those who, not willing to engage in active scientific warfare, are content to err on the safe side. As in diagnosis, so in prognosis, it is far more satisfactory to analyse each particular case, and ground our opinion upon the indications derived from the formation, and upon those derived from the general symptoms, separately and collectively.

If we except the fear of septicæmia, supposed in some cases to be brought about by the absorption of putrid matter, almost the sole danger from the presence of the formation is mechanical; and when it appears in the larynx, or shows a disposition to spread into that tube from above, it must ever inspire us with unpleasant forebodings. Consequently "The least laryngeal quality in the respiration, heard at the bed-side, is suggestive of danger" (Aitken).

Our prognosis, to be derived from the general symptoms, must be grounded on a great diversity of conditions and circumstances. In every case we must take into account: 1. The *nature* of the general disease; 2. The *variety* or *type*; 3. The *condi-*

tion of the patient, not only with regard to age and the general hygiene of his surroundings, but more especially, as to the presence of blood-taint, scrofulous, syphilitic, and the like, which, other things being equal, furnishes a very important item in the calculation of chances for or against recovery. The fact that great prevalence of miasmatic diseases is almost invariably attended, as before observed, by great mortality, requires us during such epidemics to be ever on our guard on the subject of prognosis. We cannot too closely watch our patient; and any symptom or series of symptoms appearing indicative of tendency to death, by either of the well-known modes, ought at once to be recognised, and their terrible importance duly appreciated. Symptoms significant of irregularity, or of want of power in the heart's action are especially to be looked for—nay, anticipated. "An extremely rapid and feeble pulse is of grave import; a very infrequent pulse is of fatal significance," says Dr. Jenner. Delirium, hæmorrhage, and vomiting, especially if persistent, are ever symptoms of unfavorable omen. Albuminuria, when present to any extent, must always be looked upon as a serious complication; it is, however, highly desirable to ascertain, if possible, whether the presence of albumen depends on merely an altered condition of the blood, or upon granular degeneration of the kidney; for the latter state of things not only renders an individual more amenable to the influence of morbid impressions, but the excretory power of such an important eliminatory organ as the kidney being impaired, greatly diminishes the chances of recovery. In this investigation the microscope becomes our chief aid. A terrible complication—œdema of the glottis—is generally supposed to have an especial connection with albuminous urine. In short, it will almost invariably be found that the general symptoms, when alarming enough to demand an unfavorable prognosis, indicate an abnormal (poisoned?) state of the blood; and it is to the symptoms of death beginning with that fluid upon which, for prognostic purposes we must especially rely—a pathological condition which has been so ably described by Dr. C. J. B. Williams in his 'Principles of Medicine,' that I cannot refrain from quoting from that great authority.

" *Necræmia,* or *death beginning with the blood,* are terms which I venture to give to those fatal cases in which the chief and most remarkable change is exhibited by the blood. In typhoid fevers and others of the malignant or pestilential kind, none of the solids of the body constantly exhibit such an early change of function or of structures as would warrant us in tracing disease and death to them. It is true, that the functions of many solids are impaired—the muscular and nervous systems, secretion, digestion, assimilation, and nutrition, all suffer, but the very universality of the affection seems itself to point to some cause more general than can be found in any individual function; and such a cause may be found in the blood. The blood, at an early period of these diseases, when they occur in their worst form, exhibits changes which show that disorder begins with it, and this disorder may reach to a fatal degree. The appearance of petechiæ and vibices on the external surface, the occurrence of more extensive hæmorrhages in internal parts, the general fluidity of the blood, and frequently its unusually dark or otherwise altered aspect, its poisonous properties as exhibited in its deleterious operation on other animals, and its proneness to pass into decomposition, point out the blood as the first seat of disorder, and by the failure of its natural properties and functions as the vivifier of all structure and function, it is plainly the medium by which death begins in the body. How far the change in the blood is in its struction and vital properties, or in its chemical composition, further research alone can determine; the vivifying function of the blood depends on all these combined, and it is this function which obviously fails. Hence, the complete adynamia, or general prostration of all living powers, which occurs where this cause of death is most powerful. The blood, the natural source of life to the whole body, is itself dead, and spreads death instead of life. Almost simultaneously, the heart loses its power, the pulse becoming very weak, frequent, and unsteady; the vessels lose their tone, especially the capillaries of the most vascular organs, and congestions occur to a great amount; the brain becomes inactive, and stupor ensues; the medulla is torpid, and the powers of respiration and excretion are imperfect; voluntary motion is almost suspended; secretions fail; molecular nutrition ceases; and, at a rate much more early than in other modes of death, *molecular* death follows close on *somatic* death—that is, structures die and begin to run into decomposition as soon as the pulse and breath have ceased; nay, a partial change of this kind may even precede the death of the whole body; and the fœtid aphthous patches in the throat, the offensive colliquative diarrhœa of persons in the last stage of various fatal diseases; parts running into gangrene, as in the carbuncle of plague, the sphacelous throat of malignant scarlatina, and the sloughy sores of the worst forms of typhus, and in the large intestines in dysentery, and the putrid odour exhaled even before death by the bodies of those who are the victims of similar pestilential diseases,—are so many proofs of the early triumph of death over vital chemistry," (p. 464).

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"The symptoms which should make us apprehend the approach of death by necræmia may be gathered from the preceding descriptions. Those symptoms generally called typhoid, putrid, or malignant, belong especially to this class of deadly influences. For example: a congested appearance of the whole surface, the colour being dusky or livid, and extending to the conjunctivæ, tongue, and fauces: various slight exanthematous or papular patches on the skin, often with petechiæ; more extensive hæmorrhages in form of ecchymoses, or oozings of thin bloody fluid from the gums, nostrils, and sometimes from other passages; extreme prostration of strength, with an obtuse state of all the senses and mental faculties, sometimes combined with delirium and twitchings of the limbs; half-closed eyes and dilated pupils; a very frequent, weak, and soft pulse; frequent and unequal respiration; no appetite; intense thirst; a dry, brown tongue, with dark sordes on the lips and teeth; a progressive fall of temperature, which may have been elevated at first; often cold, clammy and fœtid perspiration; hiccup; subsultus tendinum; scanty, offensive urine; involuntary discharges," (p. 468).

[illegible]

Etiology. — The zymotic theory of the origin of diseases, supposes each specific disease to have, as its cause, a specific, though non-cognisable agent; and these agents have received different names according to that of the disease they induce. Diphtheria is thus referred to a peculiar ζυμη, called *diphtherine*. When diseases admit of isolation and close definition, this doctrine of cause and effect answers sufficiently well; but when we attempt to apply it to such an ill-defined affection as diphtheria, we encounter much that is antagonistic to its reception. In the first place, we should expect to find a single cause to be attended with some approach to uniformity, with regard to its concomitants and associations; and, in the second place, we should look for similarity of effect as the result of identity of cause. No one can for a moment doubt that each of these conditions lacks fulfilment in the case of the disease under consideration. We find diphtheritic affections to occur under every possible variety of climatic and telluric condition, with faultless as with the most faulty sanitary arrangements, in the open healthy districts of the country, as well as in the close, badly ventilated purlieus of the town, in localities the most opposite in every way, and answering to every description. Then, as to the effect, it is made up of one constant uniform element—the local symptom—which, it is fair to presume, is the result of a constant uniform cause, together with an inconstant very variable element—the general symptoms—which, it is equally fair to presume, is the result of a multitude and diversity of causes. If this be so, then we have grounds for believing that the cause of the constant is not identical with the cause of the inconstant element; in other words, that the cause of the formation is not one and the same, as the cause of the various general diseases, considered either collectively or individually, with which it is seen to be associated.

Having said thus much in opposition to the theory that would connect such a diversity of phenomena, as occur in diphtheritic cases, with a single cause, let us now consider the subject as under the other headings; let us separate our idea of the so-called disease diphtheria into two elements, and examine the question of etiology, with regard, firstly, to the formation; and, secondly, to the general symptoms. By so doing, I hope we shall encounter nothing irreconcilable, but much that admits of harmonious generalisation.

Having previously attempted to show that the formation is a substance *sui generis*, and totally different from any of the usual morbid products of the body; that it appears only on such parts as are exposed to the action of the air; that it requires such parts to be undergoing pathological change; and that, when connected with general symptoms, it often appears before the development of such general symptoms; I think it reasonable to infer the *ultima causa* of the phenomenon to be atmospheric, proceeding from without rather than from within. So much as to whence the agent comes; but what it is, at present neither chemistry nor microscopy has enabled us incontrovertibly to determine. The atmosphere and morbid condition of part exposed furnish two factors; but what the *tertium quid* is, must be left, I fear, quite as much to analogy and inference, as to actual demonstration. The statement previously put forth that "the microscope seldom discloses vegetable or other growths," though supported by the highest authorities, must be taken only for what it is worth—it simply supports a negation. On behalf of those who hold the opinion that the diphtheritic product is due to the influence of such organisms, it must be remembered, that as "there are more things in heaven and earth than are dreamt of in your philosophy," so doubtless there are more things organic and inorganic, in and around us, than can in the present state of science be detected by the highest powers of the microscopist, or the most subtle tests of the chemist. Inability to discover microcosms, especially epiphytes, can scarcely as yet ever be adduced as proof of absence. "It is not to be hastily concluded that a disease is non-parasitic, because a fungus has not been detected in the part where it was suspected to exist. The minuteness of the sporules, and the care required in the investigation, sufficiently explain the very various opinions which have prevailed on the nature of these parasitic lesions" (Lowe quoted by Aitkin, vol. ii, p. 180). But, in addition to this, we have in the case of the phenomenon under consideration, the direct evidence of some of our most trustworthy observers. Dr. Carpenter in the last edition of his work (1863), on the 'Microscope and its Revelations,' says: "There are various diseased conditions of the human skin and mucous membrane, in which there is a combination of fungoid vegetation and morbid growth of the animal tissues; this is the case, for example, with the tinea favosa, a disease of the scalp in which yellow crusts are formed, that consist almost entirely of the mycelium, receptacles, and sporules of a fungus; and the like is true also of those white patches (aphthæ), on the lining membrane of the mouth of infants, which are known as thrush, and *of the exudations of false membrane in the disease termed diphtheria*;" and he goes on : "In these and similar cases, two opinions are entertained as to the relation of the fungi to the diseases in which they present themselves; some maintaining that their presence is the essential condition of these diseases which originate in the introduction of the vegetable germs; and others considering their presence to be secondary to some morbid alteration of the parts wherein the fungi appear, which alteration favours their development. The first of these doctrines derives a strong support from the fact, that the diseases in question may be communicated to healthy individuals through the introduction of the germs of the fungi by inoculation; while the second is rather consistent with general analogy, and especially with what is known of the condition under which the various kinds of fungoid 'blights' develop themselves in or upon growing plants." Taking, then, all things into consideration, the external position and atmospheric origin of the production, the many points of analogy between it and the products of aphthous and other known parasitic affections, the fact of the great prevalence of parasitic affections in brutes as well as in man, contemporaneously with the diphtheritic epidemic, and, added to these, the heavy weight of Dr. Carpenter's opinion, and of those who hold with him, I think it will be conceded that the *balance* of evidence is, notwithstanding the inability of microscopists uniformly to establish it, in favour of those who believe the origin of the formation to be connected with the presence of living organisms.

An inquiry into the etiology of the general symptoms, involving, as it does, an inquiry into that of zymotic diseases generally, is, at the same time, one of the most interesting and difficult subjects of medical study, and one which, in the present state of our knowledge, can be but imperfectly carried out. That such diseases have specific causes, and that the causal agents, whatever else they may be, are something more than the offspring of bad sanitary arrangements (however much their development and growth may be favoured thereby), is, I believe, generally received; but what they are, either as to form or nature, is a problem still *sub judice.* Reasoning from what we know to be the case with small-pox, cow-pox, glanders, hydrophobia, syphilis, and other inoculable diseases, it is perhaps most in accordance with analogy to suppose the origin of zymotic diseases to be dependent on the presence of certain organic *principles;* but what these principles actually are, in what state they exist (some fixed, others volatile, some both), in what manner they act, so as to bring about their effects, are points which science has not as yet enabled us, satisfactorily, to determine (Dr. Herbert Barker); and, as my object is rather to bring forth a particular theory of the nature of diphtheria, and to reconcile it with experience, I need not farther discuss the subject. All I require is, that the different general diseases which during a diphtheritic epidemic present themselves in connection with the local sign, shall be considered as subservient to a like etiology as when occurring without such complication.

The summary, then, of what has been

written on the subject of etiology amounts to this; that as there are two distinct elements in a diphtheritic case, so are there two distinct causes; and that, in all probability, the origin of the external formation is due to the presence of living organisms, and of the general disease to certain zymotic principles. Before quitting the subject it may be well to venture a thought or two on the mutual relation and inter-dependence of these two exciting causes, which by their composite action produce, what is considered by many to be, a specific disease. Two ideas are inseparably (in my mind) connected with the presence of these microscopic growths:—1. That their very starting into active life is the result of the presence of some particular exciting cause. And 2. That, when vitalised, they have a design to fulfil. To apply these ideas to the case under consideration: May not the presence of these zymotic principles in the atmosphere, when existing to an unusual amount, the evidence of which must be judged by the extent of the prevalence and malignancy of their effects, the specific diseases, be the particular excitor into being of these living organisms? And, on the other hand, may not the design these organisms are intended to carry out be the changing the state of, and thus rendering innocuous, these terribly baneful principles? Should this be so, we have but another example of that beautiful system of balance and counterpoise so everywhere manifest in the world of nature; but, as in the moral world so in the physical, there is no unmixed good, in the bringing about these states of equilibrium certain supplemental or marginal effects are permitted, often detrimental to, and alone attracting the attention of, mankind. For, as in the beautiful readjustment of meteorological derangement man sees only the incidental effect—the inclement season, the drought, or long-continued wet; as in the fearful grandeur of the thunder-storm he loses sight of the marvellous restoration of electrical disturbance, and dwells only of the incidental damage done to man or beast; or, to take a more homely simile, as in the garden he recognises only the trifling mischief of the small bird, and overlooks its necessity as an antidote to the still greater ravages committed by insect life; so, in the case of the disease before us, we discern not the mighty good these microcosms effect in destroying pestilential incitors, and think only of the *blight* they are incidentally permitted to fix on us. But, further, according to modern view, these *principles* not only exist externally (epidemic and endemic), but also are reproduced in, and emitted from, bodies undergoing disease (contagious). In epidemic sore throat (and the same probably holds good of several other diseases, for a "more or less sore throat is a constant concomitant of nearly all the acute specific diseases") the pharyngeal region appears to be the site of the local symptom; here it is that pathological change is going on in contact with the air, and hence it is we should expect contagia to be emitted. The same reasoning applies to the laryngeal region in croupal cases. Now, "wheresoever the carcase is, there will the eagles be gathered together;" and thus, not content with neutralising poisonous matters external to us, these organisms, in obedience to a splendidly designed scheme, seem, as it were, actually to descend upon the parts whence poisons would be scattered broadcast, and kill them in the bud. Speculations such as these may be idle, and need corroboration, still I hope they are not altogether irrelevant or useless; for, if we are enabled to look from these supplemental effects, these lesser evils, patent to the eye of sense, to that higher order of harmonies, to be seen only by the mental eye of thought, we may be induced to temper our sorrow with gratitude; and, while deploring and bearing as patiently as possible the trials and afflictions permitted to vex us here below, our faith is strengthened in, nay, we are even allowed to enjoy foreshadowings of, that condition of perfection which shall one day be revealed to us.

Contagion.—Perhaps there is no subject in connection with diphtheria so unsettled and unsatisfactory as that of contagion. By some the disease is believed to be eminently contagious; by others, to a limited extent; by others, again, not at all. By adopting the specific disease theory, some of these views must necessarily be wrong; by adopting the theory hoped to be substituted, they all may possibly be right.

The contagiousness of the local sign is not, so far as I am aware, supported by a single fact which cannot quite as readily be placed to the score of its undoubtedly epidemic character. Capability of inoculation, in Bretonneau's sense of the term, is, I believe, generally discarded. That the substance, if placed in contact with a part of the body undergoing disease, might help to bring about the production of a like morbid product, admits of easy comprehension; but that it could, of itself, induce anything like a disease of the general system we have certainly no evidence to lead us to suppose. Exception may, perhaps, be taken to this statement in certain instances, wherein the diphtheritic formation is engrafted upon those parts of a body labouring under a general disease of an undoubtedly contagious character, from which the special contagious principle would be disseminated. In these cases it is easy to understand how the formation may have incorporated with it contagious materials, and under a careful system of inoculation bring about a specific disease; and on this principle would I explain away the facts of those who hold the contagiousness of the diphtheritic product. Even in such cases, according to the doctrine of etiology here advanced, the presence of the formation diminishes rather than increases the power of propagating general diseases. In any work on diphtheria the unique experiment of Trousseau, though incapable of proving anything, is worthy of being recorded, if only as an instance of how far the love of science will overstep the bounds of prudence. He says, "I wished to perform upon myself a direct experiment, with the view of ascertaining the communicative action of the serous secretion which flows in such abundance from the cutaneous surfaces attacked with *diphtherite*. I accordingly steeped a lancet in a false membrane which I had just extracted from a diphtheritic wound, and I made one puncture in my left arm, and five or six on the tonsils and velum palati. I found on my arm, at the seat of puncture, that a vesicle was developed very similar to that of vaccination, but there was no result upon the mucous membrane." ('Sydenham Society Memoirs,' p. 240.)

The contagiousness of the general disease is often so intermingled with, and bears such a direct proportion to, its epidemic character, as to be not always readily made out. We may not even be able satisfactorily to diagnose such general disease, owing to the absence of positive symptoms, and in such case we can only fall back upon the generally received fact that extensive epidemic prevalence is invariably associated with more or less contagious properties, and thus find grounds for considering such diseases always to be, to a greater or less degree, contagious.

I would suggest, then, that the contagiousness or not of a diphtheritic case depends mainly on the contagiousness or not of the general disease; and knowing such diseases to be most various, we can, by adopting this view, understand how any particular case may have this property to a great degree, slightly, or not at all. I am glad to be strengthened in this opinion by Daviot, who concludes a masterly summary on the subject of contagion as follows:—"I repeat the proposition which seems to me to reconcile conflicting opinions, that we cannot regard pharyngeal *diphtherite* as contagious when it exists alone and independent of all eruptive fevers; but I think that, when it is complicated with those eminently contagious affections it may become so, but in an indirect manner." ('Sydenham Society Memoirs,' p. 361.)

Treatment.—I now approach the last and most important test by which the truth or otherwise of the proposed theory of the nature of diphtheria is to be tried. Having endeavoured to show how the various questions arising on the subjects of diagnosis, prognosis, etiology, and contagion, admit of more satisfactory solution, all that remains to me is to inquire whether, by adopting such a theory, treatment can be placed on more rational bases. Since unity of disease naturally tends to uniformity of treatment, while diversity suggests diversity of remedies, at the first blush we appear somewhat as losers by the change proposed. If, however, in any particular epidemic, diversity of disease be once established, it is vain any longer to hope satisfactorily to carry out treatment by uniformity of remedy.

Treatment of complex epidemics of miasmatic diseases, especially when extensive and malignant, if to be conducted with credit to ourselves, demands a close acquaintance with all that pertains to the principles and practice of treatment applicable to diseases generally. All that experience, judgment, and vigilance can effect will be required at our hands. Symptoms must be watched for and detected by every available means, and their significance fully recognised, while every weapon which can in any, even the slightest, manner be made to influence our dread enemy must be brought into action. In this warfare let us ever be mindful of our true position; let us remember we are but allies—it may be powerful and necessary allies—and that the heat and brunt of the fight has to be borne by the reparative forces of the constitution. Still, by coming *energetically* to the rescue, by knowing when to strike and when to forbear, by breaking down impediments *à fronte,* and by imparting *vis à tergo,* we may often so assist Dame Nature that many a conflict, otherwise doubtful, shall be decided in her favour. Above all things, time must be gained, for in such cases it may often be said with truth "time is life." The type of the epidemic must be closely studied; and when, as in the recent prevalence of diphtheritic diseases, that shall prove to be asthenic, special heed must be taken, and any indications in that direction promptly assailed. Local complications are to be attended to; disordered secretions, as far as possible, to be rectified. Sustenance, most concentrated in form and nutritious in kind, is to be regularly administered by the mouth, and, if necessary, by the rectum; while stimulants, alcoholic and ammoniacal, are to be unsparingly supplied on demand. Animal heat must be husbanded by attending to the temperature of the apartment and to the clothing of the patient. No sanitary defect can be safely left unrectified; especially must concentration of poison, either by crowding together affected patients or by neglecting proper ventilation, be guarded against.

It is needless further to extend these remarks, for, in a word, these terrible visitations require of us all that is implied in the term "skilful treatment"—that difficult accomplishment which can only be the resultant of a mind well stored with knowledge received by the avenues of study and observation, a judgment educated to draw correct inferences, and a will ready to carry out decisions.

Having thus far indulged in generals, I will now descend to particulars, and endeavour to show how, by adopting the views advocated, "treatment, having more reliable indications, becomes less empirical, more rational, more successful;" and in order to accomplish this it will be well to tabulate some of the various diphtheritic diseases, and then, following the usual plan, to consider cursorily the treatment applicable—1. To the external complication. 2. To the general symptoms. Under the second heading, rather than go into a description of the numerous states of system, and descanting on the remedies for each, I propose to consider, *seriatim,* the various therapeutical agents which have been brought forward as beneficial in diphtheria, viewed as a distinct disease, and to endeavour to point out the applicability of each to particular conditions.

Diphtheritic diseases may be arranged, according to locality, as follows:

Skin.

Conjunctiva.

Mucous membrane of the female genital organs.

Cavity of the mouth.—Thrush; stomatitis; noma; canker; &c.

Nose.—Chiefly catarrhal, or extending from below.

Throat.—Strumous or other enlargements of the tonsils; chronic pharyngitis—relaxed throat; the phthisical throat, or analogous condition in other chronic exhausting diseases; syphilis; epidemic sore throat, benign or malignant; quinsy;* influenza; scarlet fever; measles (?); smallpox; fevers—typhus, typhoid, relapsing, remittent, intermittent, puerperal, &c.; erysipelas, &c.

Air-passages.—Epidemic croup; measles; extending from above.†

The term influenza requires a word of explanation. It expresses, in my opinion, rather than one acute specific disease, a group comprising many, and perhaps widely different, general diseases, which, owing to close analogies and to absence of positive symptoms, are incapable of isolation or of reference to their proper places in our nosologies. These diseases, always remarkably epidemic, and manifesting that disturbance of the general system to which we apply the term "low fever," are, like other febrile disorders, capable of existing in a mild or in a malignant form. The name simply expresses an influence; and that during the recent epidemic of diphtheritic diseases an influence, or influences, have been at work, other than those which produce the well-known specific diseases, may, perhaps, be conceded. If there be a somewhat new disease during such epidemics it must, I take it, for the present remain hidden in this division of the mucous fevers. If there be cases which admit not of arrangement, *quoad* their general symptoms, as instances of common epidemic sore throat, of one of the specific fevers, of croup, or of some other recognisable disorder, such cases, until furnished with diagnostic signs sufficient to enable us to remove them, must be received into that common category of miasmatic diseases which embraces the analogous effects of unknown *influences*. Under this heading I would for the present include all the many "doubtful and anomalous" cases of fevers. Severity, being a relative property, has no bearing on the question of kind. Let me again repeat I dare not altogether deny the existence of such a general disease as diphtheria; all I contend for is that, in the present state of our knowledge, we have no means of distinguishing it; and, more especially, that it bears no special relation to the formation, other than that of contemporaneous existence.

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* "More rarely the tonsils suppurate." (Dr. H. Greenhow 'On Diphtheria,' p. 8.)

† "It should be borne in mind, also, that cynanche tonsillaris does sometimes, by extension of the inflammation to the neighbouring parts, superinduce that very formidable species of cynanche—cynanche laryngia." (Dr. Watson's 'Lectures,' vol. i, p. 808.)

So too, the word catarrhal, applied to diphtheritic affections of the nose, is used in its etymological sense, as expressing simply a condition, without the slightest reference to the cause or causes upon which that condition depends.

Local Treatment.—From what has been advanced it follows that the treatment necessary for the local symptom ought to be such as will have a tendency to bring about healthy action in the part undergoing disease, and thus render it no longer amenable to the influence of the external agent. In furtherance of this object, local remedies are of unquestionable service. Their value, however, will differ greatly, according as the case shall be one of local disease, *pur et simple,* or of general disease with local complication; for while in the former case they may be looked upon as curative, and all that is required in the shape of treatment, in the latter they can be esteemed only as adjuvants, capable of restraining and moderating the local complication.

All strong remedies, especially if frequently applied, are greatly to be deprecated, as liable to produce those very pathological conditions which it should be our constant endeavour to prevent; and in this opinion I believe I am supported by modern experience generally, though a like *rationale* has not, so far as I am aware, been previously given.

Diphtheritic affections of the *skin* do not seem to require any special treatment. They are not in themselves dangerous ; and all we have to do is to ensure cleanliness, rest—mechanical and physiological, and to employ mild stimulating applications.

Conjunctivitis, when diphtheritic, is to be treated in like manner as when not so complicated ; the principal local means consisting of applications of solutions of nitrate of silver, the use of suitable collyria, and protection from light.

In affections of the *female genital organs* it is important to ascertain whether the foundation disease be simple or syphilitic in character; for while in the former case simple means suffice, in the latter, such special remedies as dusting with calomel, black wash, &c., must be resorted to.

When the disease presents itself on the parts within the *cavity of the mouth,* the concentrated solutions of the salts of copper, not too frequently applied, become the most convenient and efficacious of topical remedies ; as assistants, we have borax, myrrh, honey, cream, &c.

In the *nose,* not having the same facilities for inspection, while principles remain the same, other modes of practice must be had recourse to. The syringe comes to our aid in the application of liquids, while powdered alum, calomel, snuff, &c., may be received by insufflation.

To enumerate half the remedies which have been applied in diphtheritic affections of the *throat,* would be a tedious and profitless task. Founded on Trousseau's view, that "by interposing energetically to combat the first manifestation [of diphtheria], we may sometimes arrest the progress, and prevent ulterior manifestation," every possible medicament, no matter how potent its action, deemed capable of attaining the end, has found advocates for its employment. It is a view about which I am happy to say with Dr. Jenner, "that the doctrine taught in the text, founded on my own experience, is quite opposed to." (Jenner 'On Diphtheria,' p. 104.) All that I find it necessary to resort to in practice, are applications from time to time of moderately strong solutions of nitrate of silver, or of sulphate of copper. Of the two, the copper is, perhaps, the preferable remedy, for not only is it more cleanly, but its emetic action, especially at the commencement of the case, is often of signal service. When the patches are distinct and isolated, a large camel-hair pencil becomes the most convenient instrument of application. The membrane around, and especially below, requires the effect of the remedy, for the diseased action has a particular tendency to spread downwards, and it is in that direction that danger is most to be dreaded. When the morbid product is more extensive, especially when of the soft variety, with much infiltration, and this, according to my experience, particularly occurs in erysipelatous cases, the swab will unquestionably be found to answer better.

Next to astringents I believe the most useful topical remedy to be glycerine. It seems to afford protection to the inflamed surface, to allay irritation, and to expedite recovery. If, however, we keep clearly in view the indications to carry out which local remedies are applied, the actual mode and frequency of application and agent to be chosen, may be safely left to the judgment of the practitioner.

Gargles answer two indications: 1, assisting the local remedies in their stimulating tonic effects; 2, washing away and deodorising detached particles. For the first purpose we employ astringents, such as the mineral acids, tincture of the perchloride of iron, alum, &c.; for the second, chlorinated preparations and permanganate solutions.

*Ice,** cold water, solutions of nitrate of potash, &c., have a cooling antiphlogistic effect upon the parched and inflamed surfaces, and, especially when grateful to the patient, are to be recommended. On the other hand, inhalation of steam, either of water or of vinegar and water, will, in some cases, especially of epidemic sore throat with a tendency to suppuration (quinsy), be found to afford greater relief.

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* One of the greatest benefits to be derived from the employment of ice seems to be due to its local anæsthetic effect. By dulling the sensibility of the organs of deglutition our patients, especially when young, become enabled the better to swallow medicine, wine, &c.

Counter-irritation, though not generally of much service, is to be employed on the same principle as if the epidemic had no diphtheritic complication. Blisters, owing to liability to cutaneous diphtheria, had better be avoided ; but a mustard poultice, applied early, has often appeared to me to act beneficially. When it is desirable to keep the external skin in a state of more or less congestion, stimulating embrocations may be resorted to ; for this end, too, warmth, after the manner of poultices, becomes a useful auxiliary—linseed meal, bread, bags of heated oats, bran, or potatoes, according to choice.

In *laryngeal* cases, our direct means of local treatment become more difficult of application, and less efficacious. Blisters here, too, had best be avoided ; and, perhaps, the most useful external application is the hot moist sponge, as recommended by Dr. Graves, over the neck and upper part of the chest ; for not only does it act beneficially as a direct fomentation to the affected parts, but, also by imparting warmth and moisture to the inspired air. Of tracheotomy, having no experience, I forbear to speak.

Disinfecting vapours.—It may be as well here to mention certain agents employed chiefly as disinfectants; for, although primarily intended to destroy noxious emanations, they admit, in one sense, of being considered as local remedies. An atmosphere more or less charged with chlorine, iodine, or ammonia, impinging on the diseased mucous membrane, acts as topically as the fluid applications of Beaufoy or Condy, and assists in furthering a like end.

Iodine has recently been brought forward with great commendation by Dr. Richardson, who believes that by it, "in one of the worst cases of smallpox he ever saw, he was enabled to deodorise the air of the patient's apartment with a facility and comfort never before experienced, and that the process contributed largely to the recovery of the case;" and also, "that iodine thus used affords a good practical index as to the purity of the air in the apartment. If, on volatilisation, the odour of the metaloid be long in being developed, the evidence is clear that the air is proportionately charged with organic matters." (See 'British Medical Journal,' 1863, vol ii., p. 601.)

General Treatment.—Chlorate of Potash.— This medicine must be a special favorite in the treatment of diphtheritic diseases; for no matter what else be recommended, it invariably receives favorable mention. The many points of resemblance between the diphtheritic false-membrane, and the white patches of thrush and its allied diseases, naturally suggests the idea of their being analogous morbid products; and any remedy known to possess a marked influence over the one, was likely to be introduced as applicable to the treatment of the other. The result is that, whenever the diphtheritic sign presents itself, it has become a matter of custom to resort to chlorate of potash. The action of this medicine is involved in obscurity. "It does not appear to undergo any chemical change in its passage through the system; a fact fatal to the hypothesis of the chemico-physiologists, who fancied that it gave oxygen to the system, and was, therefore, well adapted to patients affected with scorbutic conditions, which were supposed to depend upon a deficiency of that principle." (Pereira.) Yet, notwithstanding all this, like many other articles of our Materia Medica, its use is pretty well recognised, and its employment understood, though its *modus operandi* may not admit of ready explanation. It is generally considered to be one of the so-called salines; to possess cooling, diuretic, febrifuge powers; and have a similar action to the nitrate, though, acording to my experience, in the display of such powers it is vastly inferior to the last-named salt. In the treatment of foul ulcerated conditions of the parts within the cavity of the mouth, ample experience confirms its value; and, under such circumstances, its beneficial action may be relied on.

Nitrate of potash is an older and better established fever medicine, while its use in cases of inflamed states of the mucous membrane of the faucial region has long been acknowledged.

Speaking summarily, then, chlorate of potash is the special remedy in *diphtheritic affections of the mouth,* and is of secondary importance in feverish states of the general system. Nitrate of potash is more applicable to *affections of the throat* in sthenic cases, and is one of the best febrifuges we possess.

Guaiacum.—At the close of Dr. Watson's lecture on 'Cynanche Tonsillaris,' he says: "I ought perhaps to add, that recently Mr. J. Bell, of Barhead, has very strongly recommended the internal administration of powdered guaiacum in large doses, as being almost a specific in the case of cynanche tonsillaris. He gives as much as half a drachm, suspended by means of mucilage in a draught, every six hours. Mr. Bell has no doubt that the remedy, if timely administered, will cut the disease short in ninety-nine cases out of a hundred. It has been found successful in other hands also." I have not had an opportunity of consulting Mr. Bell's contribution; but have had ample means for testing the efficacy of his remedy. It has long been my custom to prescribe it with confidence and satisfaction in the treatment of cases of ordinary sore throat; and I have no hesitation in recording my belief that, under such circumstances, it possesses a very decided influence for good. I was consequently early induced to resort to it in diphtheritic affections; and according to my experience, the best means of general medical treatment of *epidemic sore throat with diphtheritic complications* will be found in the judicious employment of this medicine.

Ammonia.—The 'British Pharmacopœia' furnishes us with a preparation, the ammoniated tincture of guaiacum, wherein guaiacum and ammonia are in happy combination—a preparation admirably adapted to affections of the throat in connection with general asthenic conditions; in a word, the desideratum in the treatment of diphtheria. I generally suspend the guaiacum by means of honey, and give it in the proportion of half a drachm of the tincture to an ounce of water. Of this mixture, from a tea- to two table-spoonfuls are to be given every hour or every four hours, according to age of the patient and to the severity of the case. In sthenic conditions, the remedy admits of admixture with nitrate of potash; while, when asthenia prevails, excess of ammonia may be added.

Independently of the part which ammonia plays in the preparation just alluded to, it is of itself worthy of being considered one of the most serviceable of remedies in the treatment of diphtheritic diseases. In the low fevers, and whenever the heart's action shows signs of feebleness, this remedy, either in solution or in the state of vapour, must always be employed. But, more than this: of late ammonia has been brought forward as possessing special powers over the fibrine of the blood—checking its formation and promoting its solution; and, on these grounds, according to Dr. Richardson, in affections accompanied with excessive formation and separation of fibrine, it is to be looked upon in the light of almost a specific. In the treatment of *scarlet fever* Dr. Witt, and others, speak most highly in its favour; though here, again, I prefer it in the preparation of guaiacum just alluded to.

The *tincture of the perchloride of iron* takes a deservedly high place among the numerous remedies brought forward as applicable to the treatment of diphtheritic affections; for, when administered in answer to suitable indications, it is undoubtedly gifted with potent virtues. It has now, thanks to the late Mr. G. Hamilton Bell, fully established its claim to be considered the best therapeutical agent we have, when properly administered, in the management of erysipelas. And the nearer any diphtheritic case shall approach, in its general characteristics those of that disease, the more confidently can the beneficial action of this preparation be relied on. In closely packed, badly drained, badly ventilated districts of large towns, we look for erysipelatous affections more than in the open country; and in such localities it is, I doubt not, that this remedy, first introduced by Dr. Heslop in his practice amongst diphtheritic cases at Birmingham, will be found more specially indicated and more generally successful. It has also long been known to be particularly applicable to certain affections of the kidney, and to have a decided controling power over albuminuria, when occurring in the course of general diseases. Purpura, too, is a symptom which calls for its administration in suitable combinations. Again, knowing the intimate relationship between erysipelas and some forms, at least, of puerperal fever, this is the medicine we should be most inclined to trust in any case of the latter disease putting on the diphtheritic character. Lastly, I make it a rule of practice to prescribe this preparation in the convalescent stages of all diphtheritic affections, and to continue its action for some time; for not only is it a most useful tonic and assistant towards recovery, but also, as I am inclined to think, a powerful prophylactic against sequelæ. From what has been said, it follows that, *whenever the diphtheritic sign occurs in con-*

nection with erysipelatous affections or puerperal fever—whenever in a diphtheritic case albuminuria and purpura manifest themselves —and whenever we require a tonic to assist convalesence or to ward off secondary affections—the tincture of the perchloride of iron becomes a remedy worthy of special commendation.

Iodine and the Iodides.—In *chronic enlargements of the tonsils,* a condition particularly predisposed to assume the diphtheritic character, the iodide of iron, with cod-liver oil, becomes the most appropriate medicine; while the *syphilitic* throat—and I have known bad and obstinate cases of so-called diphtheria to be nothing more than this disease complicated—requires, if to be satisfactorily treated, the employment of the iodide of potassium. The diphtheritic syphilitic affection, like erysipelas, is, doubtless, more frequently met with in urban than in rural practice, and, consequently, the practitioners of our cities will be more constantly called upon to resort to this particular remedy in the treatment of diphtheria than we of the country. Dr. Willoughby Wade claims great powers for the iodide of potassium as a diphtherial medicine. He gives the following propositions:

1. "Assuming the presence of a substantive poison in the system, we know no drug which will act as a direct eliminant, but iodide of potassium. It positively eliminates lead, and, we may presume that it positively eliminates syphilis.

2. "I employ iodide of potassium in two, three, or four grain doses, every two or three hours. I have been in the habit of conjoining with it chlorate of potash in five or ten grain doses.

3. "I have known no instance of fatal termination where this plan of treatment has been carried out. I have known no instance of serious symptoms or of secondary paralysis supervening where this plan has been rigorously carried out."

Quinine may be employed as a general tonic in diseases attended with such, often rapidly induced, debility as is to be witnessed during a diphtheritic epidemic, though, to my mind, with very uncertain consequences. It is as a fever medicine, as an antiperiodic, rather than tonic, that its beneficial effects are displayed; and, whenever the general disease puts on the *intermittent* character, and this is often the case in districts where *ague* is wont to abound, quinine and arsenic become our sheet-anchors.

The *mineral acids* are, perhaps, as useful as anything in the treatment of *diphtheritic complications of the relaxed throat ;* and, according to Dr. Chambers and those who go with him, they furnish us with the best medicines for cases of the *continued fevers.*

Calomel.—Much, and to my thinking unnecessary fear has prevailed on the subject of the use of calomel in diphtheritic cases. It behoves us to study well our disease; to be fully alive to its asthenic character; and to exercise due caution in the administration of depressants; but, on the other hand, let us beware lest our caution become over-caution, and we neglect to employ means of benefit to our patient. A smart purge of calomel, in combination with rhubarb, jalap,

&c., when indicated, will have a rectifying influence on disordered secretions, will assist in eliminating *materies morbi,* and often cut short the disease. In *diphtheritic croup,* calomel is to be administered in like manner, as in croup not so complicated. The usual emetics and expectorants having been tried, a small dose of calomel every hour, until one of its physiological effects, the chopped spinach evacuations, be produced, has, in my hands, proved a successful mode of treatment, and one to which we must not be afraid to resort.

From this survey, rapid and meagre though it be, of the different medicaments which have been brought forward as applicable to the treatment of diphtheria, we are enabled to see; firstly, that each one may become the most suitable remedy, according as certain states of the system shall indicate; and, secondly, that the study of the proper place and relative value of such general remedies, which, by continuing to look upon diphtheria as a single disease, must remain a matter of the greatest perplexity, becomes, by substituting the view of its complex nature, a matter of the greatest simplicity.

Now and then epidemics of miasmatic diseases come amongst us in such a terrible shape, that *curative* treatment, be it never so rational, seems completely powerless. No matter how well we think, how judiciously we act, patient after patient succumbs; and we are driven, sorrowfully yet honestly, to confess the total inability of medicines to cope with the destroying influence. Some cases are so rapidly fatal as to give no time for the sufficient introduction of remedies; and others, owing to the parts concerned in the function of swallowing being implicated, admit not, it may be, of their suitable administration. The true explanation, however, of our want of success lies, probably, deeper than in reasons such as these; and is to be found in the conviction daily growing upon us that therapeutic agents are not, especially in diseases of this class, to be looked upon as directly *curative,* but rather only as amongst the means of ordinary *treatment.* So long as we confine medicines to their proper place, expecting from them only what they can possibly perform (and much it is, I grant), we shall not be disappointed; but if we invest them with mysterious powers for good, which they certainly do not, and possibly it is not according to the nature of things that they ever can, possess, we not only lay ourselves open to bitter disappointment, but bring discredit on our art. When curative treatment becomes so unsatisfactory, it is well to turn our attention to preventive. Diphtheritic diseases are known "to manifest a decided tendency to be restricted to particular places, and to cling, as it were, to particular houses" (Greenhow). The dwellers on one side of a river, in one village in a district, in one or two—not necessarily contiguous—houses in a village, are, not unfrequently, the only ones affected. The diseases resembling in this particular certain vegetable blights, which, as we know, will appear in one farm in a neighbourhood, one field in a farm, or even one furrow in a field. This peculiar feature at once suggests a preventive remedy, which the confused notions prevalent on the subject of contagion have hitherto prevented from being carried out as fully as it deserves to be, viz. the prompt removal, of at least the unaffected, from infested to non-infested localities. Nor need we, in order to accomplish this, always go far; for I firmly believe I have seen disease prevented in the unaffected, and stayed in the affected members of a family, by removing them no further than across the road. Let us remember too, that, as the overcrowding of patients affected with diseases of this character is the great means of concentrating and fostering miasmatic poisons, so a well-arranged system of segregation, combined with careful attention to all sanitary particulars, becomes our chief resource for weakening the power of, and preventing the ravages of, these deleterious influences.

Sequelæ.—Any contribution on the subject of diphtheria must be considered incomplete which leaves unnoticed the secondary affections, proved by experience liable to affect the diphtheritic patient. "A peculiar character of the voice, resembling that produced by affections of the throat in secondary syphilis, is a common result of diphtheria, and often continues for many weeks after recovery. The power of swallowing is sometimes so impaired that there has been difficulty in sustaining life during convalescence; and liquids especially are apt, even after a comparatively slight attack of the disease, to be regurgitated through the nostrils. Extreme anæmia, impairment of vision, a peculiar form of paraplegia, weakness of the hands and arms, numbness, tenderness of the limbs, tingling, wandering pains, and more rarely, nervous sequelæ of a hemiplegic character, are, in the order here written, ulterior consequences of diphtheria. Gastrodynia, and sometimes dysenteric diarrhœa, occasionally follow diphtheria. Pain of the ear, deafness, and abscess, are occasional but rare results of the disease" (Greenhow, p. 8). Add to these sudden, often fatal, syncope, and a more or less persistent feebleness of the heart's action, and we have a tolerably complete epitome of the diphtheritic sequelæ. By those who hold the specific disease theory, these secondary affections are considered to bear a special relation to one and only one primary affection; and in all definitions of diphtheria, liability to such affections is included. I have previously attempted to show that the diphtheritic formation—the pathognomonic of the supposed distinct disease—is merely a characteristic of an epidemic of many general diseases; and I venture to assert, that these secondary affections are quite as readily understood and explained by supposing them, in like manner, to belong to many rather than to one disease. They simply indicate the prior existence of a certain pathological condition; and such condition, whatever it be, may quite likely be the common property of many analogous diseases. At present, the special pathology of the sequelæ is clouded in obscurity. Some seem to indicate that the nervous system has received an influence capable of perverting its healthy function, though morbid anatomy is as yet quite unable to disclose alteration of structure, by which to account for such perversion of function. Others seem more readily interpreted by the light which has recently been thrown on pathology from the study of emboli and their relation to over-fibrinated blood. And others, again, may perhaps be more properly classed as second affections taken on during the convalescent stage, the anæmia or spanæmia of such stage mainly predisposing thereto; for—1, they not unfrequently occur *longo intervallo* after the primary disease, to which, too, they bear no regular proportion, either direct or indirect, *quoad* severity; and, 2, the action of the only remedy found serviceable in treatment—change of air—becomes, by adopting this supposition, more easily understood. Further observation is, however, required before the final settlement of this part of my subject; it is enough for my purpose to state that hitherto no fact has been advanced in connection with the diphtheritic sequelæ, which cannot quite as readily be explained by the theory which considers them to be common to many diseases, as by that which connects them only with one.

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